TISSUE LIGATION DEVICES AND METHODS THEREFOR

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to U.S. Provisional Patent Application Ser. No. 61/778,251, filed on Mar. 12, 2013 and titled "TISSUE LIGATION DEVICES AND METHODS THEREFOR", which is incorporated by reference herein in its entirety.

FIELD

This invention relates generally to devices and methods for ligating tissue, such as the left atrial appendage, using surgically, minimally invasive or intravascular approaches.

BACKGROUND

Atrial fibrillation is a common problem that afflicts millions of patients. Atrial fibrillation often results in the formation of a thrombus, or clot, in the appendage of the left atrium. This presents a problem, inasmuch as the thrombus can dislodge and embolize to distant organs, which may result in adverse events such as a stroke. For this reason, most patients with atrial fibrillation are treated with one or more blood thinners to help prevent the formation of a thrombus. Blood thinners, however, can present health risks of their own, especially in the elderly. These risks, such as bleeding, often require a user to make significant lifestyle changes.

Several methods have been developed to address the potential problem of thrombus formation in the left atrial appendage. One such method includes suturing the left atrial appendage along the base or ostial neck where it joins the atrial chamber. In this way, blood flow into the atrial appendage is cut off, eliminating the risk of thrombus formation therein. This is typically done through open-heart surgery, which limits the availability of the procedure to those who are at a particularly high risk, or who are otherwise undergoing an open-heart procedure. In addition, open-heart surgery requires general anesthesia and has a number of well-known risks, making it less desirable.

Other methods have also been investigated. These methods include methods of stapling the base of the appendage and methods of filling the appendage with a space occupying or occluding member. Stapling is not preferred given the fragility of the appendage and its tendency to rupture, while occlusion devices may not effectively prevent all blood flow into the appendage.

Additional devices and methods for closing the left atrial appendage or other suitable tissues would therefore be desirable. In particular, devices and methods for closing the left atrial appendage using minimally invasive, intravascular, or a combination of these techniques, would be desirable in order to avoid the need for opening the chest. Of course, additional devices for use in open surgical procedures are desirable as well, especially when those devices offer additional advantages over standard devices.

BRIEF SUMMARY

Described here are closure devices and methods for closing tissues using one or more closure devices. In some variations, a closure device may comprise an elongate body and a snare sloop assembly extending at least partially from the elongate body and forming a loop. The snare loop assembly may comprise a snare and a suture loop releasably attached to the snare. The snare may comprise a first end and a second end, such that advancement of the first end of the snare relative to the elongate body increases the diameter of the loop and retraction of the first end of the snare relative to the elongate body decreases the diameter of the loop. The closure devices may further comprise a shuttle, such that the second end of the snare is connected to the shuttle, and a locking element configured to releasably couple the shuttle to the elongate body. The locking element may be further configured to release the shuttle from the elongate body. In some variations, the elongate body may comprise a recess in a side wall of the elongate body, and the shuttle may be positioned in the recess when the shuttle is releasably coupled to the elongate body. In some variations, the locking element may comprise a lock wire. In some of these variations, the lock wire may extend through a lock wire lumen of the elongate body and a lock lumen of the shuttle when the shuttle is releasably coupled to the elongate body. In some of these variations, the lock wire may comprise a bend. In some of these variations, the bend may extend at least partially into a window of the shuttle when the shuttle is releasably coupled to the elongate body.

In some variations, the shuttle may comprise a projection configured to fit within a channel within the recess of the elongate body. The projection may be configured to resist rotation between the shuttle and the elongate body. In other variations, the recess of the elongate body may comprise a projection configured to fit within a channel of the shuttle and configured to resist rotation between the shuttle and the elongate body.

In some variations, the closure devices described here may further comprise a handle attached to the elongate body. In some of these variations, the handle may comprise a suture control for tightening the suture loop, a snare control to control movement of the first end of the snare, and a snare release configured to release the shuttle from the elongate body. In variations where the locking element comprises a lock wire, the snare release may be configured to retract the lock wire. In some variations, the snare release may comprise a button configured to release the shuttle upon depression of the button. In some of these variations, the suture control may comprise a grip portion and a prong extending therefrom. The prong may be sized and configured to depress the button of the snare release. In other variations, the suture control may comprise a grip portion and a chamber in the grip portion. The chamber may be configured to at least partially enclose the snare release.

In other variations of the devices described here, the closure device may comprise an elongate body and a snare loop assembly extending at least partially from the elongate body and forming a loop. The snare loop assembly may comprise a snare and a suture loop releasably attached to the snare. The snare may comprise a proximal snare portion and a distal snare portion, each comprising an engagement portion. The engagement portion of the proximal snare portion may be configured to releasably engage the engagement portion of the distal snare portion. The snare loop assembly may further comprise a restraining sheath positioned to maintain engagement of the proximal and distal snare portions. In some of these variations, the engagement portion of the distal snare portion may comprise a first hook member and the engagement portion of the proximal snare portion may comprise a second hook member. In other variations, the engagement portion of the distal snare portion may comprise a slug and the engagement portion of the proximal snare portion may comprise a cup member. In other variations, the engagement